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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,970	09/26/2003	Naoya Hasegawa	9281-4655	7250

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EXAMINER	
BERNATZ, KEVIN M	
ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,970	HASEGAWA ET AL.	
	Examiner	Art Unit	
	Kevin M Bernatz	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-16 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-16 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 September 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 9/26/03.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Preliminary amendments to the specification and claims 1, 3, 4, 6, 8, 10, 13, 15 and 16, filed on September 26, 2003, have been entered in the above-identified application.

Examiner's Comments

2. The Examiner notes that applicants' claims include the language "length" (e.g. claim 1, line 8), "width" (e.g. claim 1, line 10) and "thickness" (e.g. claim 2, line 5). These limitations have been interpreted as follows (based on Figure 1): the "length" is equivalent to the "track width direction" or the "X" direction, the "width" is along the element height direction or the "Y" direction, and the thickness is along the layer thickness direction or the "Z" direction (*see also specification, page 23*).

3. Regarding the limitation(s) "nonmagnetic metal layer" in claim 2, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, even though the layer is disclosed to be specifically of an alloy known to exhibit antiferromagnetism, the

limitation "nonmagnetic" is being interpreted to read on any alloy which exhibits an exchange coupling energy or anisotropy field, Hua, of 0.

4. Regarding claim 16, the Examiner has interpreted this claim as requiring no additional vertical bias means, since claim 1 already recites that the antiferromagnetic layers are provided to fix the magnetization direction of the first magnetic layer.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 1 – 14 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 31 of copending Application No. 10/675,435. This is a provisional obviousness-type double patenting rejection.

Regarding claim 1, App '435 disclose a magnetic sensor comprising a free magnetic layer in which a direction of magnetization is changed in accordance with an external magnetic field applied thereto, a fixed magnetic layer in which a direction of

magnetization is fixed, a nonmagnetic material layer provided between the free magnetic layer and the fixed magnetic layer, and antiferromagnetic layers fixing the magnetization of the fixed magnetic layer by exchange coupling (*claim 1*), wherein lengths in a first direction of the free magnetic layer, the nonmagnetic material layer, and the fixed magnetic layer are formed larger than respective widths thereof in a second direction orthogonal to the first direction, the direction of magnetization of the free magnetic layer is preferentially oriented in the first direction by shape anisotropy (*Figures 1 and 21 and supporting text*), the fixed magnetic layer has a multilayer structure composed of a second magnetic layer in contact with the nonmagnetic material layer, an interlayer, and a first magnetic layer provided in that order (*claim 1*), the antiferromagnetic layers are provided with an intermediate region having a predetermined length provided therebetween in the first direction so as to be in contact with the first magnetic layer (*claim 1*), a direction of magnetization of the first magnetic layer is fixed by exchange coupling in a direction crossing the first direction, a direction of magnetization, a direction of magnetization of the second magnetic layer is fixed antiparallel to that of the first magnetic layer (*claim 1 and Figures*), and electrical resistance is changed by the direction of magnetization of the free magnetic layer and that of the fixed magnetic layer at the intermediate region (*claim 1*).

Regarding the limitation(s) supported by the Figures and specification of App '435, the Examiner notes that the disclosure of App '435 teach(es) that the claimed invention is an obvious variation of the disclosed invention. Applicants are reminded that while it is generally prohibited from using the disclosure of a potentially conflicting

patent or application in an Double Patenting analysis, there are two exceptions permitted by the MPEP. Specifically, "those portions of the specification which provide support for the patent claims may also be examined and considered when addressing the issue of whether a claim in the application defines an obvious variation of an invention claimed in the patent". In the instant case since the App '435 clearly claims a magnetic sensor, and such a sensor must possess physical dimensions and magnetic directions, the relied upon subject matter is deemed to clearly supported the claimed "magnetic sensor" since one of ordinary skill in the art would have naturally turned to the specification for support as to what size the layers should be and to what direction the magnetizations should be controlled to.

Regarding claims 2 – 14, App '435 disclose identical limitations (*claims 17 - 30*).

7. Claims 1 and 16 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 17 and 26 - 38 of copending Application No. 10/823,484 (Saito et al. – U.S. Patent App. No. 2004/0207962 A1) in view of Kishi et al. (JP 2000-163717 A). This is a provisional obviousness-type double patenting rejection.

Regarding claims 1 and 16, Saito et al. ('962 A1) disclose the claimed limitations much in the same manner that App '435 did above. In addition, Saito et al. does not disclose an additional vertical biasing means for the free magnetic layer (*claim 17*), hence meeting the claimed limitations of pending claim 16.

Saito et al. fail to disclose a first AFM layer having a space in the track width direction and an electric resistance in the space changing in relation to a magnetization direction of the free magnetic layer and a magnetization direction of the second magnetic layer.

However, Kishi et al. teach a first AFM layer with a predetermined space in the track width direction meeting applicants' claimed limitations inorder to control the lead gap and overall magnetoresistive characteristics of the sensor. Given the similarity in both structure and composition of the first AFM layer and the predetermined space (i.e. a thinned portion of said first AFM layer), the Examiner deems there is sound basis that such a structure would necessarily exhibit an electric resistance meeting applicants' claimed functional limitations.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Saito et al. in view of Hasegawa (JP '309 A) to utilize a first AFM layer meeting applicants' claimed structural limitations as taught by Kishi et al. since such a structure can control the lead gap and overall magnetoresistive characteristics of the sensor.

8. Claims 2 – 12 and 14 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 17 and 26 - 38 of copending Application No. 10/823,484 (Saito et al. – U.S. Patent App. No. 2004/0207962 A1) in view of Kishi et al. (JP 2000-163717 A) as applied above, and

further in view of Lin (U.S. Patent No. 5,949,623). This is a provisional obviousness-type double patenting rejection.

Saito et al. and Kishi et al. are relied upon as described above.

Regarding claim 2, neither of the above disclose a nonmagnetic metal layer meeting applicants' claimed material and structural limitations.

However, Lin teaches that when forming an AFM layer comprising a reduced thickness middle portion located over the track width, reducing the thickness sufficiently can produce a non-magnetic material meeting applicants' claimed material and structural limitations, thereby resulting in more precisely aligned side edges (*col. 1, lines 34 – 52; col. 3, line 66 bridging col. 4, line 3; col. 5, lines 29 – 59; and col. 6, lines 13 – 37*). While Lin is directed to an AFM bias layer above a free layer, the Examiner notes that the art is analogous and since Kishi et al. already provides the motivation to thin the AFM layer above the pinned magnetic layer, Lin would be within the knowledge of one of ordinary skill in the art when turning to desired thickness values for the predetermined space. Finally, while Lin does not explicitly state that the layer forms a disordered crystal structure, the Examiner deems that such a structure is, at least in part, responsible for the observation of a loss of antiferromagnetic property, and hence would necessarily result from the reduced thickness of the AFM material in the predetermined space.

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Saito et al. in view of Kishi et al. to utilize a nonmagnetic metal layer meeting applicants' claimed limitations as taught by

Lin, since such a layer can be used to produce more precisely aligned side edges for the AFM layer.

Regarding claims 3 – 12 and 14, Saito et al. disclose a magnetization enhancement layer (i.e. applicants' nonmagnetic metal layer) and a first magnetic layer meeting applicants' claimed limitations (*claims 26 – 38*).

9. Claims 1 – 14 and 16 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 – 17 and 40 - 62 of copending Application No. 10/925,268 (Hasegawa et al. – U.S. Patent App. No. 2005/0018363 A1) in view of Kishi et al. (JP 2000-163717 A). This is a provisional obviousness-type double patenting rejection.

Regarding claims 1 – 14 and 16, Hasegawa et al. ('363 A1) disclose the claimed limitations much in the same manner that Hasegawa et al. ('389 A1) did above.

Hasegawa et al. ('363 A1) fail to disclose a first AFM layer having a space in the track width direction.

However, Kishi et al. teach a first AFM layer with a predetermined space in the track width direction meeting applicants' claimed limitations inorder to control the lead gap and overall magnetoresistive characteristics of the sensor.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Hasegawa et al. ('363 A1) to utilize a first AFM layer meeting applicants' claimed structural limitations as taught by

Kishi et al. since such a structure can control the lead gap and overall magnetoresistive characteristics of the sensor.

Regarding claim 2, Hasegawa et al. ('363 A1) disclose that reducing the thickness of the antiferromagnetic (AFM) layer can result in the AFM no longer exhibiting an exchange coupling field, hence meeting the claimed limitation of "nonmagnetic" (*claims 40 – 43*). Given that Kishi et al. teach reducing the thickness of the center of the AFM layer while leaving the ends sufficiently large to still exert exchange coupling, the Examiner deems that the presently claimed limitations would have been obvious in view of the combined teachings of Kishi et al. and Hasegawa et al. ('363 A1).

Regarding claims 3 – 14 and 16, Hasegawa et al. ('363 A1) claim substantially identical subject matter (*claims 1 – 74*).

10. Claim 1 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 14 and 15 of U.S. Patent No. 6,608,740 B2 (Tanaka et al.) in view of Kishi et al. (JP '717 A).

Regarding claims 1, Tanaka et al. disclose the claimed limitations much in the same manner that Hasegawa et al. ('389 A1) did above (*claim 1*).

Tanaka et al. fail to disclose a first AFM layer having a space in the track width direction nor an electric resistance functioning as claimed by applicants.

However, Kishi et al. teach a first AFM layer with a predetermined space in the track width direction meeting applicants' claimed limitations inorder to control the lead

gap and overall magnetoresistive characteristics of the sensor. Given the similarity in both structure and composition of the first AFM layer and the predetermined space (i.e. a thinned portion of said first AFM layer), the Examiner deems there is sound basis that such a structure would necessarily exhibit an electric resistance meeting applicants' claimed functional limitations.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. to utilize a first AFM layer meeting applicants' claimed structural limitations as taught by Kishi et al. since such a structure can control the lead gap and overall magnetoresistive characteristics of the sensor.

Neither Tanaka et al. nor Kishi et al. disclose controlling the lengths and widths of the relative layers to meet applicants' claimed limitations.

However, Fukuzawa et al. (U.S. Patent App. No. 2002/0048690 A1) teach that it is known in the art to control the sensor "length" (*Figures 30 and 51 – "HMD"*) to be larger than the sensor "width" (or height) (*Figures 30 and 51 – "HD"*), since such a configuration allows for reduced Barkhausen noise (*Paragraph 0583*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. in view of Kishi et al. to utilize sensor "lengths" and "widths" meeting applicants' claimed limitations as taught by Fukuzawa et al., since such a configuration allows for reduced Barkhausen noise.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 is indefinite since it refers back to "the free magnetic layer and at lease one of the laminates form the structure according to Claim 1", yet claim 1 is directed to a magnetic sensor comprising a free layer and many additional layers. Claim 1 never refers to a group of layers as a "laminate" and it is unclear if the "laminate" of claim 15 is separate from the layers of claim 1, includes all the layers of claim 1 or includes only those layers of claim 1 specifically recited/repeated in claim 15 (which is further unclear since a dependent claim already includes all the limitations of the claim(s) from which it depends from). As such, the Examiner deems that one of ordinary skill in the art cannot readily ascertain the scope attempted to be covered by claim 15 and no art has been applied to claim 15 for this reason.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (U.S. Patent App. No. 2001/0014000 A1) in view of Kishi et al. (JP '717 A).

Regarding claim 1, Tanaka et al. disclose a magnetic sensor comprising a free magnetic layer in which a direction of magnetization is changed in accordance with an external magnetic field applied thereto (*Figure 5, element 14*), a fixed magnetic layer in which a direction of magnetization is fixed (*elements 12A, 12B and 12C*), a nonmagnetic material layer provided between the free magnetic layer and the fixed magnetic layer (*element 13*), and antiferromagnetic layers fixing the magnetization of the fixed magnetic layer by exchange coupling (*element 11*), the direction of magnetization of the free magnetic layer is preferentially oriented in the first direction by shape anisotropy (*Figure 5*), the fixed magnetic layer has a multilayer structure composed of a second magnetic layer in contact with the nonmagnetic material layer, an interlayer, and a first magnetic layer provided in that order (*Figure 5, elements 12A, 12B and 12C*), a direction of magnetization of the first magnetic layer is fixed by exchange coupling in a direction crossing the first direction, a direction of magnetization, a direction of magnetization of the second magnetic layer is fixed antiparallel to that of the first magnetic layer (*Figure 5*).

Tanaka et al. fail to disclose a first AFM layer having a space in the track width direction nor an electric resistance functioning as claimed by applicants.

However, Kishi et al. teach a first AFM layer with a predetermined space in the track width direction meeting applicants' claimed limitations inorder to control the lead gap and overall magnetoresistive characteristics of the sensor. Given the similarity in

both structure and composition of the first AFM layer and the predetermined space (i.e. a thinned portion of said first AFM layer), the Examiner deems there is sound basis that such a structure would necessarily exhibit an electric resistance meeting applicants' claimed functional limitations.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. to utilize a first AFM layer meeting applicants' claimed structural limitations as taught by Kishi et al. since such a structure can control the lead gap and overall magnetoresistive characteristics of the sensor.

Neither Tanaka et al. nor Kishi et al. disclose controlling the lengths and widths of the relative layers to meet applicants' claimed limitations.

However, Fukuzawa et al. (U.S. Patent App. No. 2002/0048690 A1) teach that it is known in the art to control the sensor "length" (*Figures 30 and 51 – "HMD"*) to be larger than the sensor "width" (or height) (*Figures 30 and 51 – "HD"*), since such a configuration allows for reduced Barkhausen noise (*Paragraph 0583*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. in view of Kishi et al. to utilize sensor "lengths" and "widths" meeting applicants' claimed limitations as taught by Fukuzawa et al., since such a configuration allows for reduced Barkhausen noise.

15. Claims 2, 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. in view of Kishi et al. as applied above, and further in view of Lin (U.S. Patent No. 5,949,623).

Tanaka et al. and Kishi et al. are relied upon as described above.

Regarding claim 2, neither of the above disclose a nonmagnetic metal layer meeting applicants' claimed material and structural limitations.

However, Lin teaches that when forming an AFM layer comprising a reduced thickness middle portion located over the track width, reducing the thickness sufficiently can produce a non-magnetic material meeting applicants' claimed material and structural limitations, thereby resulting in more precisely aligned side edges (*col. 1, lines 34 – 52; col. 3, line 66 bridging col. 4, line 3; col. 5, lines 29 – 59; and col. 6, lines 13 – 37*). While Lin is directed to an AFM bias layer above a free layer, the Examiner notes that the art is analogous and since Kishi et al. already provides the motivation to thin the AFM layer above the pinned magnetic layer, Lin would be within the knowledge of one of ordinary skill in the art when turning to desired thickness values for the predetermined space. Finally, while Lin does not explicitly state that the layer forms a disordered crystal structure, the Examiner deems that such a structure is, at least in part, responsible for the observation of a loss of antiferromagnetic property, and hence would necessarily result from the reduced thickness of the AFM material in the predetermined space.

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. in view of Kishi et al. to

utilize a nonmagnetic metal layer meeting applicants' claimed limitations as taught by Lin, since such a layer can be used to produce more precisely aligned side edges for the AFM layer.

Regarding claim 3, the limitation(s) "epitaxial" and "heteroepitaxial" in claim 18, have given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, any layer deposited on an adjacent layer is deemed to meet the limitations "epitaxial" and "heteroepitaxial", since the broadest reasonable definition of "epitaxial" as it would be interpreted by one of ordinary skill in the art is "directly on".

Regarding claim 5, Kishi et al. disclose reducing the AFM layer to thickness values meeting applicants' claimed range (*Paragraph 0032 of Machine Translation*), as does Lin for reducing the AFM material to a non-magnetic material in the predetermined space (*col. 6, lines 21 – 33*).

16. Claims 6 – 9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. in view of Kishi et al. and Lin as applied above, and further in view of Freitag et al. (U.S. Patent App. No. 2003/0179516 A1) and Tanahashi et al. (U.S. Patent App. No. 2005/0042479 A1).

Tanaka et al., Kishi et al. and Lin are relied upon as described above.

Regarding claims 6 – 9, none of the above disclose first magnetic layers meeting applicants' claimed lattice structure and/or composition limitations.

However, Freitag et al. teach a sensor comprising a pinned magnetic layer comprising a first and second magnetic layer, wherein one of the layers comprises a CoFe alloy meeting the claimed composition limitations in claim 7 and one of the layers comprises a CoFe alloy meeting the claimed composition limitations in claim 9 (*Figures and Paragraphs 0011 – 0012*). Furthermore, Freitag et al. disclose inverting these compositions so that, effectively, the "first magnetic layer" can comprise either composition (*ibid and entire disclosure*). Freitag et al. teach that such a structure results in improved self-pinning and improved magnetoresistance coefficient (*Paragraphs 0011 – 0013*).

Freitag et al. does not explicitly disclose whether the $Co_{90}Fe_{10}$ alloy possesses a fcc lattice structure meeting applicants' claimed limitations, or whether the $Co_{60}Fe_{40}$ alloy possesses a bcc lattice structure meeting applicants' claimed limitations. However, the Examiner takes the position that since Freitag et al. does not disclose any unique or special processing conditions that one of ordinary skill in the art would readily appreciate that these alloy compositions are implicitly taught to be the natural lattice structure based on the standard sputtering techniques disclosed by Freitag et al. (*Paragraph 0047*), which the Examiner deems are the claimed lattice structures (*see Tanahashi et al., Figure 9*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. in view of Kishi et al. to

utilize first magnetic layers meeting applicants' claimed limitations as taught by Freitag et al. and Tanahashi et al. since such layers result in improved self-pinning and an improved magnetoresistance coefficient.

Regarding claim 14, Freitag et al. disclose utilizing embodiments possessing a positive magnetostrictive coefficient (*examples*).

17. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. in view of Kishi et al. as applied above, and further in view of Sasaki et al. (U.S. Patent No. 6,364,964 B1).

Tanaka et al. and Kishi et al. are relied upon as described above.

Neither Tanaka et al. nor Kishi et al. disclose orienting the free magnetic layer without additional vertical biasing means.

However, Sasaki et al. teach that it is within the knowledge of one of ordinary skill in the art to orient the free magnetic layer without the expense and processing of additional vertical bias layers by proper control of the processing and material choice of the free magnetic layer (*Figures; Summary of Invention; and col. 4, lines 20 – 25*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Tanaka et al. in view of Kishi et al. to not utilize additional vertical biasing means for the free magnetic layer as taught by Sasaki et al., since avoiding such additional vertical biasing means would reduce the need for extra expense and processing in the production of the magnetic sensor.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin M. Bernatz, PhD.
Primary Examiner

May 13, 2005

Kevin M. Bernatz, PhD
Primary Examiner